

REMARKS

Applicants respectfully request entry of the amendments herein, as they introduce no new matter and raise no new issues. Applicants further request reconsideration and withdrawal of the rejections of the final Office Action of May 16, 2005 (hereinafter "Office Action"). In the interest of brevity, Applicants incorporate the remarks of Applicants' Amendment of February 24, 2005 by reference, and focus herein on the "Response to Arguments" provided at page 7 of the Office Action.

In Applicants' Amendment of February 24, 2005, Applicants noted that column 8, lines 10-15 of U.S. Patent No. 6,391,769 to Lee et al. (hereinafter "Lee"), cited in the Office Action of November 26, 2004 as disclosing "plasma treating the substrate having the metal-containing layer thereon," does not disclose or suggest plasma treatment. Apparently agreeing with this argument, the Office Action now cites column 10, lines 35-50 of Lee as teaching the recited plasma treatment. *See* Office Action, p. 7. Applicants note, however, that, while this newly cited passage from Lee does refer to plasma treatment, the treatment described therein is applied to a *different structure* than that recited in Claim 1.

In particular, Claim 1 recites:

A method of forming an aluminum structure in a microelectronic article, the method comprising:
forming a recess in a microelectronic substrate;
forming a metal-containing layer conforming to a surface of the recess and to an adjacent surface of the substrate;
plasma treating the substrate having the metal-containing layer thereon; and
depositing aluminum on the metal-containing layer to form an aluminum layer thereon.

In sharp contrast, the cited passage from column 10 of Lee states:

In another embodiment, the anti-nucleation layer 113 may be formed of aluminum nitride (AlN) if the material is formed of aluminum. The aluminum nitride layer may be formed by exposing the resultant structure, where the aluminum layer is selectively formed *only on the non-recessed region* of the interdielectric layer pattern 105, to N₂ plasma . . . (emphasis added)

In this excerpt of Lee, there is no "forming a metal-containing layer *conforming to a surface of the recess* and to an adjacent surface of the substrate." Thus, this passage does not provide the teaching alleged in the Office Action. Accordingly, Applicants respectfully submit that the rejection of Claim 1 is erroneous and should be withdrawn.

This contrast between Claim 1 and Lee highlights additional reasons supporting the patentability of several of the dependent claims. As described in the present application at page 6:

Referring to Fig. 2C, the metal layer 31 is then plasma-treated. The portion of the metal layer 31 on the top of the interlayer dielectric layer 27 is relatively more affected by the plasma treatment than the portion of the metal layer 31 in the contact hole 29. According to some embodiments of the present invention, it is preferable that these portions be selectively and differentially plasma-treated. In order to selectively and differentially plasma treat these portions, it can be advantageous to use relatively high power and/or short treatment time in the plasma treatment. It can also be advantageous to use a relatively high process pressure and/or for the contact hole 29 to have a relatively high aspect ratio. In some preferred embodiments, the plasma treatment is performed at a power level of 600~1000W and at a pressure of 1~6 Torr for about 60 seconds. The plasma treatment may be carried out by using at least one gas selected from a group consisting of argon (Ar), hydrogen (H₂), nitrogen (N₂), oxygen (O₂), nitrous oxide (N₂O) and ammonia (NH₃).

If the metal layer is formed from metal organic sources, the metal layer 31 may contain many carbon atoms. As the metal layer 31 is plasma treated, many of the carbon atoms contained in a portion 31b may be eliminated, and a portion of titanium or tantalum thereby increased. Thus, the metal layer 31 can be changed to a metal layer having a portion 31b containing fewer carbon atoms and a portion 31a containing more carbon atoms.

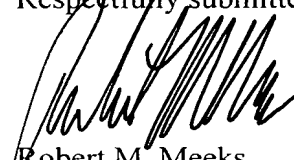
Various "selective and differential" plasma treatment conditions are recited in several of the dependent claims. Lee does not disclose or suggest such plasma treatment conditions for at least the reason that, as discussed above, the plasma treatment in Lee is applied to an aluminum layer "where the aluminum layer is selectively formed only on the non-recessed region of the interdielectric layer pattern 105." For at least these additional reasons, Applicants submit that several of the dependent claims are separately patentable.

In re: Jung-Hun Seo et al.
Serial No.: 10/620,995
Filed: July 16, 2003
Page 8 of 8

Conclusion

Applicants submit that the present application is in condition for allowance for at least the reasons discussed above, and respectfully request allowance of the claims and passing of the application to issue. Should the Examiner have any matters outstanding of resolution, she is encouraged to telephone the undersigned at 919-854-1400 for expeditious handling.

Respectfully submitted,

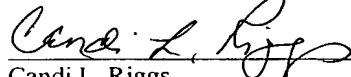


Robert M. Meeks
Registration No. 40,723

USPTO Customer No. 20792
Myers Bigel Sibley & Sajovec
Post Office Box 37428
Raleigh, North Carolina 27627
Telephone: 919/854-1400
Facsimile: 919/854-1401

Certificate of Mailing under 37 CFR 1.8 (or 1.10)

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on July 13, 2005



Candi L. Riggs